ABSTRACT

A system providing an inductive power and data link between an external transmitter and miniature internal receiver is presented. The system is suited to applications where the receiver must be of a small size and the system must consume very little power, such as an implanted biomedical device. The system is also compatible with systems where bi-directional communications are required. The novel transmitter and receiver form an improved forward data telemetry system. The transmitter consists of a Class-E converter with its optimum operating frequency being synchronously, instantaneously and efficiently altered in accordance with the data to be transmitted, thereby producing an FSK modulated magnetic field of substantially constant amplitude. The constant amplitude output allows for the continuous, data-independent transfer of power to the miniature receiver and its associated electronics. The present invention also represents an improvement over the high efficiency Class-E converters previously patented by the inventors. The receiver consists of a coil and an integrated rectifying system to recover operating power from the incident magnetic field, as well as an FSK demodulator whose operation is based on the multiphase comparison of charging times of integrated capacitors. The described FSK demodulator approach removes deleterious effects resulting from low-frequency changes in the transmitter frequency, and eliminates time distortion artifacts generated by circuit imbalances and asymmetries in the power recovery process. The combination of the transmitter and receiver improvements yields a reliable data transfer system unaffected by circuit imbalances and incidental variations in the amplitude and frequency of the magnetic field.